

CLAIMS

What is claimed is:

1. A zoom lens system, comprising:
5 a first zoom lens;
a second zoom lens aligned optically with said first zoom lens;
a cam flat including a zoom guide groove having a non-linear profile located on one side thereof;
a zoom lever in communication with said first zoom lens and said non-linear
10 zoom guide groove;
a driving mechanism for driving said cam flat linearly;
wherein linear movement of said cam flat results in said first lens being driven a non-proportional amount by said zoom lever.
- 15 2. The zoom lens system of claim 1, wherein movement of said cam flat additionally moves said second zoom lens;
3. The zoom lens system of claim 2, wherein movement of said cam flat directly drives said second zoom lens in an amount proportional to the amount moved by said
20 cam flat.
4. The zoom lens system of claim 3, wherein said second zoom lens is coupled to said cam flat by a zoom coupling linkage.
- 25 5. The zoom lens system of claim 2, additionally including a spring fixed relative to said first zoom lens to bias said first zoom lens against said zoom lever and to maintain a portion of said zoom lever in communication with said zoom guide groove.
6. The zoom lens system of claim 5, wherein said driving mechanism includes a
30 stepping motor including a threaded lead screw and a nut engaged with said threaded lead

screw, said nut being linked to said cam flat by a nut finger portion in order to drive said cam flat while said motor rotates said threaded lead screw.

7. The zoom lens system of claim 6, further including a spring biased against an end
5 of said cam flat distal from said nut to further bias said cam flat against said nut during movement of said cam flat.

8. The zoom lens system of claim 6, additionally including at least one reference
10 surface extending outward from the surface of said cam flat opposite the surface having said zoom guide groove, and a spring for biasing said finger portion of said nut against said at least one reference surface of said cam flat during rotation of said threaded lead screw.

9. The zoom lens system of claim 8, wherein said zoom guide groove profile is more
15 shallow towards in a first tele position than in a second wide-position.

10. The zoom lens system of claim 1, wherein said cam flat additionally includes a
first viewfinder guide groove having a first viewfinder lens profile and a second
viewfinder guide groove having a second viewfinder lens profile, and wherein said zoom
20 lens system additionally includes a zooming viewfinder assembly, including:

a first viewfinder lens;

a second viewfinder lens;

a first viewfinder lever in communication with said first viewfinder lens and said
first viewfinder guide groove;

25 a second viewfinder lever in communication with said second viewfinder lens and
said second viewfinder guide groove;

wherein movement of said cam flat additionally moves said first viewfinder lens
relative to said second viewfinder lens based on said first and second viewfinder lens
profiles.

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11. The zoom lens system of claim 10, wherein said zooming viewfinder assembly additionally includes an adjustment plate, said first and second viewfinder levers being pivotally fixed to said adjustment plate.
- 5 12. A zooming viewfinder assembly, comprising:
a first viewfinder lens;
a second viewfinder lens aligned optically with said first viewfinder lens;
a cam flat including a first viewfinder guide groove having a first viewfinder lens profile and a second viewfinder guide groove having a second viewfinder lens profile,
10 said cam flat additionally controlling the magnification of a zoom lens;
a first viewfinder lever in communication with said first viewfinder lens and said first viewfinder guide groove;
a second viewfinder lever in communication with said second viewfinder lens and said second viewfinder guide groove; and
15 a driving mechanism for driving said cam flat linearly.
13. The viewfinder assembly of claim 12, additionally including a spring located between said first viewfinder lens and said second viewfinder lens to push said first and
20 said second viewfinder lenses apart from one another and provide a constant force on said first and second viewfinder levers.
14. The viewfinder assembly of claim 13, additionally including an adjustment plate pivotally fixed to said first and second viewfinder levers.
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15. The viewfinder assembly of claim 14 additionally including a plurality of prisms for directing the view of the user around a turn in the viewfinder assembly.
16. A method of assembling the optics in an image capture device including a zoom
30 lens system, comprising:

- (a) providing a viewfinder assembly, comprising:
- a first viewfinder lens;
 - a second viewfinder lens aligned optically with said first viewfinder lens;
 - a cam flat including a first viewfinder guide groove having a first viewfinder
5 lens profile and a second viewfinder guide groove having a second
viewfinder lens profile, said cam flat additionally controlling the
magnification of a zoom lens;
 - a first viewfinder lever in communication with said first viewfinder lens and
said first viewfinder guide groove;
 - 10 a second viewfinder lever in communication with said second viewfinder lens
and said second viewfinder guide groove; and
 - an adjustment plate pivotally fixed to said first and second viewfinder levers,
said adjustment plate additionally including an accentor pin affixed
thereto;
- 15 (b) providing a zoom lens plate and fixing said cam flat in place relative to said
zoom lens plate stem, said zoom lens plate including a slot;
- (c) affixing said accentor pin to said slot to fix said adjustment plate relative to
said zoom lens plate; and
- (d) rotating said accentor pin to move said adjustment plate relative to said zoom
20 lens plate in order to position said guide levers relative to a desired initial starting
position.
17. In image capture device including a diopter adjustment mechanism, comprising:
- an image capture device housing;
 - 25 a diopter adjustment knob accessible through said image capture device housing
 - a rotational cam including a helical ramp, said rotational cam being engaged with
said diopter adjustment knob such that rotation of said diopter adjustment knob rotates
said rotational cam;
 - a viewfinder housing located inside said image capture device housing, said
30 viewfinder housing including a hole;

a viewfinder diopter lens movably located in said viewfinder housing and visible through said image capture device housing, said viewfinder diopter lens including an arm extending therefrom, a first face of said arm being located adjacent said helical ramp,

5 a bearing pin extending from a second face of said arm, opposite said first face, the second end of said bearing pin being fixed to said hole of said viewfinder housing; and

a spring mounted coaxially around said bearing pin between said viewfinder housing and said arm to bias a portion of said arm against said helical ramp of said rotational cam;

10 wherein rotation of said diopter knob rotates said cam, moving said helical ramp and correspondingly, moving said arm and said diopter lens linearly by an amount equal to the change in height of said helical ramp.

18. The image capture device of claim 17, wherein said arm includes a protrusion
15 located on a first face, said protrusion being located adjacent a portion of said helical ramp, wherein said spring biases said protrusion against said helical ramp.

19. The image capture device of claim 18, additionally including a detent mechanism to prevent unintentional movement of said rotational cam.

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20. The image capture device of claim 19, wherein the detent mechanism includes a spring including a spring arm, rotation of said rotational cam resulting in rotation of said detent spring arm, and wherein said image capture device housing includes a plurality of detent notches, said spring arm engageable with each of said detent notches.

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21. The image capture device of claim 19, wherein said rotational cam is located inside said diopter knob, such that rotation of said diopter knob directly drives said rotational cam.

22. The image capture device of claim 19, wherein said diopter adjustment knob is a toothed gear including a plurality of gear teeth on the circumferential edge thereof, and said rotational cam additionally includes a plurality of gear teeth around the circumferential edge, thereof, the teeth of said rotational cam engaging the teeth of said diopter adjustment knob.
23. The image capture device of claim 22, wherein the detent mechanism includes a spring including a spring arm, rotation of said rotational cam resulting in rotation of said detent spring arm, and wherein said image capture device housing includes a plurality of detent notches, said spring arm engageable with each of said detent notches.
24. The image capture device of claim 23, wherein said diopter adjustment knob additionally includes a limit stop groove and said image capture device includes a limit stop block, said limit stop block sized to travel in said limit stop groove to define the total permitted rotation of said diopter adjustment knob.
25. A diopter adjustment mechanism for an image capture device, comprising:
a diopter adjustment wheel gear including gear teeth, therearound;
a knob gear including teeth therearound, the teeth of said thumbwheel gear being enmeshed with the teeth of said diopter adjustment wheel, said thumbwheel gear including a ramp formed on the rear surface thereof;
a viewfinder optical lens including a follower arm, said follower arm biased in contact with said ramp,
wherein, rotation of said diopter adjustment wheel gear results in linear motion of said viewfinder optical lens.